Interface

Emilio Sanchez, Nicolas Castagné, Ronan Boulic, Jorge Juan Gil

Interface

Emilio Sánchez [CEIT]
Nicolas Castagne [ACROE&INPG]
Ronan Boulic [EPFL]
Jorge Juan Gil [CEIT]

Contributors: Sylvain Cardin [EPFL]

Generally speacking, an interface is the point, area or surface in which converge two or more distinct entities. Therefore, the term interface can be used to denote any mean that realizes the interconnection of two entities. Also, when considering an entity, an interface can be an abstraction that the entity provides of itself to the outside world.

In the technological fields connected to enaction, the word interface may be seen as a buzzword, given the particularly numerous meanings it covers. However, in all these fields, it can acquire much more precise meanings. This item reviews a subset of these many meanings that are often encountered when dealing with enactive systems.

Interface, in software design (computer sciences)

In software design, the interface of a software entity (namely: a class, in object-oriented programming) consists in all the functionalities (namely: methods or functions) of the entity that are publicly available, hence usable from other parts of the software to modify the state of the entity in a consistent manner. More generally, in the same context, one calls application programming interface (API) all the functionality of a larger piece of code (namely: a software library) that can be used for building a larger program.

In object-oriented programming, interface acquires a more precise definition. It is, either:

- a specific category of class that has no implementation, but only promises the future existence, in subclasses, of a couple of services (namely: methods). The subclass is then said not to inherit, but to implement the interface.
- or, equivalently, a set of methods that the object must respond to.

Finally, in computer sciences, one can call interface (of the computer) the various computer's communication ports. For example, a network interface is the network card of the computer.

User interface, in human computer interaction

In (traditional) human computer interface (HCI) [→ Human computer interaction], the term interface stands for user interface. Even though HCI is concerned with the interactive system in its whole, the user interface usually denotes only a specific part of the software that enables the interactions, and implements the interaction of the user with the core features of the software. It excludes, for example, the devices by which the user manipulates the user interface, and also the core features (the know-how) of the software.

Rather old categories of (user) interfaces in HCI include textual interfaces (UNIX Schell…), graphical interfaces (with widgets: windows, buttons… The most common type of user interface in everyday computers), and direct manipulation interfaces (graphical interfaces based on an either "faithful" or metaphorized interactive representation of the document on which the user works. Exemples are the graphical desktop metaphor [→ Metaphors in human-computer interaction], most word processors, image editors…).

More recent or specific qualifiers of the user interfaces that are particularly important in the field of enactive systems, and which incidentally may apply not only the user interface but also to the whole interactive

system at hand, are intuitive, reactive, proactive, multimodal and ergotic.

- Intuitive interface

As expressed by Bærentsen in [Bærentsen, 01]: "*An intuitive interface may be defined as an interface, which is immediately understandable to all users, without the need neither for special knowledge by the user nor for the initiation of special educational measures.*" In computer science the term intuitive interface is commonly used in a perverted way, for describing logical metaphors that allow easy understanding of the system interface (usually through direct manipulation). However, by principle, no interface based on a metaphor can be considered as truly intuitive since it requires a prior knowledge of the system to understand the metaphor. Indeed, the closest implementation of a perfect intuitive interface can be perhaps found in virtual reality systems where the user performs natural movement are user to interact, as in reality.

- Proactive interface

A proactive interface is an interface able to predict future events and take appropriate action accordingly, especially by alerting the user or proposing solutions to deal with the forthcoming situation [Bustamante et al., 02]. For example in application controlling objects in movement, a proactive interface could alert about possible future collisions and help the user to take counteractions to avoid them. An example of proactive interface is the companion of an editor; the proactive interface behaviour is implemented in an avatar that proposes tips about logical future actions. [Xiao et al., 03] offers an evaluation of such proactive user interface assistants.

- Reactive interface

A reactive interface is in general an interface that gives feedback about encountered events by modifying its behaviour. [Pucella, 98] defines reactive systems as "*systems that maintain an ongoing interaction with their environment, activated by receiving input events from the environment and producing output events in response*". As opposition to proactivity, reactivity of an interface can be seen as the faculty of an interface to give a proper output response after an event as occurred. Reactivity is also used to characterize the manner in which the system will treat its inputs to produce the most appropriate outputs; especially, the shorter the response time is, the more reactive the interface is. Finally, in many cases, to qualify a system as an enactive system, the overall reactivity of the whole system is crucial (for example, see "instrumental interaction" [→ Instrumental interaction]).

- Ergotic interface

An ergotic interface is an interface that makes it possible to simulate an energy exchanged between the user and virtual objects he/she manipulates. The adjective ergotic is important in the context of enactive systems; the reader will find more details in the item "Interface, ergotic" [→ Interface, ergotic].

- Multimodal interface

Finally, multimodal is another possible qualifier of the interface or of a whole system that is also important for enactive systems. The term, which actually requires clarifications, is analyzed in the item [→ Interface, multimodal / multisensory].

Interface, in robotics and haptics

In these fields, hardware interface can be used to denote some gesture device. In particular, in robotics, when a robot is to be used by a user to interact with a computerized system, it is often called a robotic interface. Not all the computer devices are "robots" (e.g. the screen and the mouse are not). Conversely, haptic interfaces [→ Haptics, haptic devices] are often active robotic interfaces, since kinaesthetic feedback involves movements and efforts. However, for fine tactile feedback, other devices [→ Tactile device] are used instead of robotic interfaces.

Enactive Interfaces?

In the expression enactive interface, usually, the term interface stands more for the whole system than for the user interface, as specifically defined in HCI. Very shortly said, the expression is a practical mean, an ellipsis,

to denote whether or not, or how much, the system at hand allows the user to enact the lived world [→ Lived body / lived world: phenomenological approach]. This idea is further analysed for example in [→ Interface, enactive] and, more generally, in… all the items in the Handbook.

References

[Bærentsen, 01] Bærentsen, K. B. : Intuitive user interfaces. Scand. J. Inf. Syst. 12, 1-2 (Jan. 2001), 29-60.

[Pucella, 98] Pucella, R.R., "Reactive programming in Standard ML," Computer Languages, 1998. Proceedings. 1998 International Conference on , vol., no.pp.48-57, 14-16 May 1998

[Bustamante et al., 02] Bustamante, F.E.; Widener, P.; Schwan, K., "Scalable Directory Services Using Proactivity," Supercomputing, ACM/IEEE 2002 Conference , vol., no.pp. 65- 65, 16-22 Nov. 2002

[Xiao et al., 03] J, Catrambone, R, Stasko, JT, "Be Quiet? Evaluating Proactive and Reactive User Interface Assistants" - Georgia Institute of Technology publisher - GVU Technical Report;GIT-GVU-03-03, 2003. Available on line at: http://smartech.gatech.edu/dspace/handle/1853/3216?mode=simple

Related items

Haptics, haptic devices
Human computer interaction
Instrumental interaction
Interface, enactive
Interface, ergotic
Lived body / lived world: phenomenological approach
Metaphors in human-computer interaction
Tactile device